applying predetermined voltages to the selected lines of the row electrodes during a selection period, wherein

the selection period of a display frame is divided so as to enable time ratio of a first display frame to a second display frame to be different in two continuously displayed frames, and

the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern by reducing a number of changes of voltage levels in each of the divided selection periods.

## REMARKS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claims 1-21 are pending in this application. Claims 1, 2, 5-10, 13, 16-19, and 21 were rejected under 35 U.S.C. § 102(b) as anticipated by *A Generalized Addressing Technique for RMS Responding Matrix LCDs* to Ruckmongathan. Claims 3, 4, 11, 12, 14, 15, and 20 were indicated as allowable if rewritten in independent form.

Initially, Applicants thank the Examiner for the indication of allowable subject matter, and for the courtesy of an interview extended to Applicants' representatives on March 27, 2003. During that interview, the outstanding rejection was discussed in detail. Further, during that interview, Applicants' representatives presented comments and proposed claim changes, which are submitted herein, emphasizing differences between the claims and the applied art. During the interview, the Examiner indicated such claim amendments would be further considered when formally presented in the filed response with accompanying comments.

Addressing the above-noted rejection, that rejection is traversed by the present response.

It is initially noted that each of the pending independent claims is amended by the present response to clarify a feature recited therein. Specifically, independent Claim 1 is amended by the present response to clarify that "the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern by reducing a number of changes of voltage levels in each of the divided selection periods." The other independent claims are similarly amended.

The claims as currently written are directed to a method or device for driving a liquid crystal display device. Several lines of row electrodes in a liquid crystal display device are simultaneously selected and voltages are applied to the selected lines of the row electrode during the selection period. The selection period of a display frame is divided, and column electrodes are driven with a voltage pattern to reduce a number of changes of voltage levels in each of the divided selection periods.

In a non-limiting example, Figure 10 shows that gradation data is generated for driving an LCD device to produce an intermediate tone. The gradation data of three display lines (L1, L2, and L3) consist of a 3/4 gradation level, a 2/4 gradation level, and a 1/4 gradation level, and there occur three change points of voltage level in the second selection period, as shown in Figure 11C. Accordingly, uneven display is increased because of deformation of the waveform at the change point of voltage levels. To alleviate the uneven display, a column data converter modifies the voltage pattern to exchange the order of T2 and T3 to be (2, 2, -2, -2), as shown in Figure 9B. Then, in the voltage pattern after modification, there is only one change point of voltage level (see the specification at page 47, lines 3-23, and Figures 9A, 10, and 11C).

The above-noted operations recited in the claims as currently written distinguish over the teachings in the applied art.

In contrast to the claim features, Ruckmongathan is directed to an addressing technique for lowering supply voltage (see the Abstract on page 80 of Ruckmongathan). In the system of Ruckmongathan, a number of mismatches between two selected subgroups of a display are compared to select a voltage $V_i$ if the number of mismatches is i (see Ruckmongathan at page 80). However, Ruckmongathan does not teach or suggest driving column electrodes "with a voltage pattern by reducing a number of changes of voltage levels in each of the divided selection periods," as in the independent claims.

Thus, Ruckmongathan is deficient to anticipate the claims for at least the above-discussed reasons.

As agreed during the interview of March 27, 2003, the above-discussed claim amendments and arguments are believed to distinguish the independent claims over the applied art, pending updated search and consideration.

In such ways, each of the claims as currently written is believed to distinguish over the applied art.

In addition, Claims 1, 8, 16, and 17 have been amended to correct a minor grammatical informality.

As no other issues are pending in this application, it is respectfully submitted that the present application is now in condition for allowance, and it is hereby respectfully requested that this case be passed to issue.

Respectfully submitted,

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IN THE CLAIMS

--1. (Twice Amended) In a driving method for a liquid crystal display device, the method comprising:

selecting simultaneously a plurality of lines of row [electrode] electrodes in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes; and

applying predetermined voltages to the selected lines of the row electrode during a selection period, wherein

the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern [so as to reduce] by reducing a [change] number of changes of voltage [level] levels in each of the divided selection periods.

8. (Twice Amended) In a driving method for a display device having display elements in a matrix form and producing voltage levels for effecting gradation display, the method comprising:

setting a time of at least one frame period to be different from that of another frame period, in a plurality of continuous display frames;

dividing the selection period of at least one frame in the plurality of display frames into divided selection periods; and

providing on-data and off-data in the selection period of the non-divided frame period and the divided selection periods to produce a plurality of voltage levels;

wherein the plurality of voltage levels are used for a display except for the voltage levels in the vicinity of highest and lowest voltage levels, and

wherein column electrodes are driven with the voltage patterns by reducing a number of changes of the voltage levels in each of the divided selection periods.

16. (Twice Amended) In a driving device for a liquid crystal display device for selecting simultaneously a plurality of lines of row [electrode] electrodes in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes, and applying predetermined voltages to the selected row electrodes during a selection period, the driving device comprising a driving means for driving column electrodes according to a predetermined voltage pattern in each period formed by dividing a selection period of a display frame so that the divided selection periods have a different time ratio.

wherein the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern by reducing a number of changes of voltage levels in each of the divided selection periods.

17. (Twice Amended) In a driving device for a liquid crystal display device for selecting simultaneously a plurality of lines of row [electrode] electrodes in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes and applying predetermined voltages to the selected row electrodes during a selection period, the driving device including a driving means, the driving device further comprises:

a timing control means which forms a combination of at least one of two continuous display frames in which time ratio of a display frame period to the other is within 50 – 90%, and supplies a timing signal to column drivers for driving column electrodes, so that a selection period of at least one of the two continuous display frames is divided into two portions to produce an n (n: an integer of at least 3) number of divided periods,

a gradation processing means for producing n-bit gradation data based on inputted image data to write the n-bit gradation data in frame memories, and

a column data producing means for producing column data by reading sequentially the n-bit gradation data which are stored in the frame memories in the respective divided periods and supplying the produced data to the column drivers,

wherein the column data processing means converts the data into a form to reduce a number of changes of voltage levels in each of the divided selection periods.

21. (Amended) In a driving method for a liquid crystal display device, the method comprising:

selecting simultaneously a plurality of lines of row electrodes in a liquid crystal display device comprising a plurality of row electrodes and a plurality of column electrodes; and

applying predetermined voltages to the selected lines of the row electrodes during a selection period, wherein

the selection period of a display frame is divided so as to enable time ratio of a first display frame to a second display frame to be different in two continuously displayed frames, and [column electrodes are driven with a voltage pattern so as to reduce a change of voltage level in each of the divided periods]

the selection period of a display frame is divided, and column electrodes are driven with a voltage pattern by reducing a number of changes of voltage levels in each of the divided selection periods.--